

***Health Consultation***

**Old Mill Town Mall  
Edmonds, Snohomish County, Washington**

September 27, 2001

Prepared by

Washington State Department of Health  
Under Cooperative Agreement with  
Agency for Toxic Substances and Disease Registry



## **Foreword**

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of a health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. The health consultation allows DOH to respond quickly to a request from concerned residents or agencies for health information on hazardous substances. It provides advice on specific public health issues. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

For additional information or questions regarding DOH, ATSDR or the contents of this health consultation, please call the Health Advisor who prepared this document:

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## Glossary

<b>Acute</b>	Occurring over a short period of time. An acute exposure is one which lasts for less than 2 weeks.
<b>Agency for Toxic Substances and Disease Registry (ATSDR)</b>	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
<b>Aquifer</b>	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
<b>Cancer Risk Evaluation Guide (CREG)</b>	The concentration of a chemical in air, soil or water that is expected to cause no more than one excess cancer in a million persons exposed over a lifetime. The CREG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on the <i>cancer slope factor</i> (CSF).
<b>Cancer Slope Factor</b>	A number assigned to a cancer causing chemical that is used to estimate it's ability to cause cancer in humans.
<b>Carcinogen</b>	Any substance that can cause or contribute to the production of cancer.
<b>Chronic</b>	A long period of time. A chronic exposure is one which lasts for a year or longer.
<b>Comparison value</b>	A concentration of a chemical in soil, air or water that, if exceeded, requires further evaluation as a contaminant of potential health concern. The terms comparison value and screening level are often used synonymously.

<b>Contaminant</b>	Any chemical that exists in the environment or living organisms that is not normally found there.
<b>Dose</b>	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
<b>Environmental Media Evaluation Guide (EMEG)</b>	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on ATSDR's <i>minimal risk level</i> (MRL).
<b>Exposure</b>	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).
<b>Groundwater</b>	Water found underground that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater often occurs in quantities where it can be used for drinking water, irrigation, and other purposes.
<b>Hazardous substance</b>	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
<b>Indeterminate public health hazard</b>	Sites for which no conclusions about public health hazard can be made because data are lacking.
<b>Media</b>	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.

<b>Minimal Risk Level (MRL)</b>	An amount of chemical that gets into the body (i.e., dose) below which health effects are not expected. MRLs are derived by ATSDR for acute, intermediate, and chronic duration exposures by the inhalation and oral routes.
<b>No apparent public health hazard</b>	Sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.
<b>Oral Reference Dose (RfD)</b>	An amount of chemical ingested into the body (i.e. dose) below which health effects are not expected. RfDs are published by EPA.
<b>Organic</b>	Compounds composed of carbon, including materials such as solvents, oils, and pesticides which are not easily dissolved in water.
<b>Parts per billion (ppb)/Parts per million (ppm)</b>	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
<b>Reference Dose Media Evaluation Guide (RMEG)</b>	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on EPA's oral reference dose (RfD).
<b>Route of exposure</b>	The way in which a person may contact a chemical substance that includes ingestion, skin contact and breathing.

**U.S. Environmental  
Protection Agency  
(EPA)**

Established in 1970 to bring together parts of various government agencies involved with the control of pollution.

**Volatile organic  
compound (VOC)**

An organic (carbon-containing) compound that evaporates (volatilizes) easily at room temperature. A significant number of the VOCs are commonly used as solvents.

## **Background and Statement of Issues**

The Washington State Department of Health (DOH) has prepared this health consultation in response to a request from the Snohomish Health District (SHD). SHD received reports of illness attributed to contamination discovered at the Old Mill Town Mall, a retail shopping area, located in Edmonds, Snohomish County, Washington.<sup>1</sup>

The Old Mill Town Mall is located at 201 - 5<sup>th</sup> Avenue South within the commercial district of the City of Edmonds. The mall occupies a building constructed in the early 1900s that was formerly occupied by Yost Garage where buses were manufactured and maintained and automobiles were serviced.<sup>2</sup> The original building was located at the corner of 5<sup>th</sup> Avenue South and Dayton Avenue. The building was expanded at least three times early in its history and was divided into a number of service bays. Some of the bays were used for manufacturing and servicing vehicles; others were used to display automobiles that were reportedly sold at the Yost Garage.<sup>3</sup> The Yost Garage was converted to retail space sometime prior to 1973.<sup>2</sup> The property is currently bounded by Maple Street to the south; Dayton Avenue to the north, 5<sup>th</sup> Avenue South to the west, and commercial buildings to the east (Figure 1).

The building reportedly is underlain by concrete floors.<sup>3</sup> Whether the concrete floors were installed when the building was constructed, however, is unknown. A portion of the concrete floor was covered with wood flooring when the building was converted to retail space.<sup>3</sup> Historic photos displayed at the mall show floor drains within some of the building areas. The exact locations of the drains, however, are unknown. The type of materials discharged into these drains and whether the drains discharged directly into the underlying soil is also unknown.

Some of the tenants at the mall have complained about petroleum odors in their shops and have reported adverse health effects associated with the odors. One of the tenants, who reported health effects, is located near an area in the eastern portion of the building where oily sediments were discovered in two sumps.<sup>1</sup> The oily sediments were removed from the sumps in mid-April 2001.<sup>1</sup> It was determined during the sediment removal that the sumps are concrete lined.<sup>4</sup>

### **Site Visit**

Representatives from DOH and SHD visited the Old Mill Town Mall on April 10, 2001, to observe site conditions. The mall property is generally covered with wood structures and pavement. A limited area of landscaping, where soil is exposed at the ground surface, is located in the southwest portion of the property. No obvious signs of contamination or chemical odors were noted during the site visit. The two sumps located below the eastern portion of the building, where oily sediments were observed, were not accessible during the site visit.

## Environmental Studies

Four limited environmental studies were conducted at the Old Mill Town Mall since the late 1980s to evaluate whether certain areas of the site contain contaminated environmental media. Samples were analyzed for petroleum, metals, volatile organic compounds (VOCs), semi-volatile organic compounds and/or polychlorinated biphenyls (PCBs), chemicals likely to be associated with the type of activities conducted at these areas of the site.

- An environmental investigation was conducted at the site in 1989 to locate underground storage tanks (UST), determine tank contents, and evaluate whether the tanks had leaked. Two tanks were discovered and limited information about the location of some former tanks removed from the southwest portion of the site prior to 1973 was obtained. The larger of the two tanks, a 10,000-gallon UST containing a small amount of fluid, was discovered in the upper parking area and a 1,000-gallon UST, filled with waste oil, was discovered west of the entrance to the public restrooms near the building wall (Figure 1).<sup>2</sup> No soil samples were collected at the former UST locations in the southwest portion of the site. Soil samples collected below the 10,000-gallon tank were analyzed for gasoline and diesel. No gasoline or diesel range contaminants were detected. As a result, it was assumed that the tank had not leaked.<sup>2</sup>

Soil samples were also collected at the 1,000-gallon tank. Because of the proximity of the tank to the building wall, soil sampling was limited to the west and south sides of tank. The soil samples were analyzed for oil range petroleum compounds, metals, chlorinated solvents, and polychlorinated biphenyls (PCBs). Oil range petroleum compounds were detected from 5 milligrams per kilogram (mg/kg) to 941 mg/kg. Methylene chloride was the only chlorinated solvent detected. However, it was also reportedly detected in the laboratory blank. No PCBs were detected above a detection limit of 0.05 mg/kg. The metal results were also below the detection limits.<sup>2</sup> However, the analytical method used to measure metal concentrations in soil only measured metals that could leach from the sample, not total metals. As a result, metal concentrations reported for soils in this area are likely underestimated.

The USTs were subsequently cleaned and abandoned in-place because of concerns about the potential effects of the tank removal on nearby structures.<sup>5</sup> The contaminated soil identified in the vicinity of the 1,000-gallon UST was left in-place because of concerns about undermining a structural wall of the building.<sup>6</sup>

- Snohomish Health District (SHD) collected and analyzed sediment from two sumps located in a cement covered crawl space in the eastern portion of the mall on February 27, 2001, after complaints were received about contaminated sediments. The sediment samples were analyzed for lead, chromium, cadmium, petroleum, and semi-volatile organic compounds. Lead concentrations ranged from 8470 to 18,000 mg/kg, chromium concentrations ranged from 73.9 to 86.7 mg/kg, and cadmium ranged from 8.55 to 12.0

mg/kg. Oil range petroleum compounds were estimated at 57,000 to 80,000 mg/kg. No gasoline or diesel was detected. However, the detection limits for gasoline and diesel were elevated - 200 mg/kg for gasoline and 500 mg/kg for diesel. Low levels of polynuclear aromatic hydrocarbons (PAHs) were also detected.<sup>8</sup> PAHs are common constituents detected in diesel through oil range petroleum contaminated soils.

- On March 1, 2001, another investigation was conducted at the sumps by one of the mall tenants because of petroleum odors entering their shop. One sediment sample was collected from each sump and analyzed for gasoline to oil range petroleum compounds, benzene, toluene, ethylbenzene, and xylene. Gasoline range hydrocarbons were detected at 65 to 310 mg/kg; diesel was detected at 11,000 to 18,000 mg/kg, and motor oil was detected at 120,000 to 180,000 mg/kg. The sample with the highest gasoline concentration contained ethylbenzene and xylenes at 0.11 and 0.19 mg/kg, respectively.<sup>8</sup>
- Indoor air sampling was conducted at the mall on April 5, 6, 12, and 13, 2001, by the property manager. The Designer Consignor and Silver Rose retail spaces on the first and second floors, respectively, were sampled because the tenants reported petroleum-like odors. Another sample was collected in the hallway on the third floor. Samples were collected using 6 Liter Summa canisters and analyzed for volatile organic compounds and formaldehyde. Benzene (3 to <4.4 ug/m<sup>3</sup>); toluene (11 to 45 ug/m<sup>3</sup>); mp-xylene (4.6 to <5.9 ug/m<sup>3</sup>); 1,4-dichlorobenzene (<5.8 to 9.7 ug/m<sup>3</sup>); acetone (9.5 to 30 ug/m<sup>3</sup>); 2-propanol (8.7 to 28 ug/m<sup>3</sup>); and formaldehyde (7.9 to 12.3 ug/m<sup>3</sup>) were detected above analytical reporting limits in at least one of the air samples. Xenon and 2-methyl butane were tentatively identified in at least one sample along with other unknown compounds.<sup>9</sup>

Only limited information was available about how the samples were collected and analyzed during the studies described above. DOH assumes that adequate quality assurance and quality control measures were followed with regard to sampling procedures, chain-of-custody, laboratory procedures and data reporting. The validity of DOH's analyses and the conclusions drawn for this health consultation are determined by the reliability of the referenced information.

## Discussion

Only limited environmental investigation has been conducted at the Old Mill Town Mall site to determine if past site uses have resulted in the contamination of various environmental media. As a result, it is not possible to determine if all exposure pathways were identified. The available environmental data, however, does allow a limited determination to be made about potential exposure to contaminants at the site.

Past, current, and future tenant and shopper exposure to the contaminants found in the soil surrounding the former waste oil tank where petroleum and other contaminants were detected is limited to the inhalation route of exposure since the contamination is located below the ground surface. Exposure by inhalation could only occur, however, if the contaminants vaporize and migrate up through the soil column into the building. This pathway, however, is unlikely if the concrete floors are intact within the mall.

Past, current or future worker exposure to the contaminated soil surrounding the former waste oil tank is possible if contaminated soil is encountered during soil excavation activities. Past exposure to contaminated soil at the location of the former waste oil tank could have occurred through dermal contact, incidental ingestion, or inhalation. This type of exposure, however, likely occurred infrequently, if it at all, since only limited property development appears to have occurred since the site was developed in the early 1900s. Current and future exposures are also unlikely since no property development is planned.

No current or future exposure pathway exists for contaminated sediments found in the sumps under the eastern portion of the building because they were removed in April 2001. Past exposure to contaminants in sump sediments via direct contact was likely infrequent and limited to maintenance workers accessing the crawl space. Mall workers could have been exposed to vapors moving from sump sediments into indoor air at the mall. However, no air data is available to directly evaluate this exposure pathway.

In April 2001, three air samples were collected and analyzed for formaldehyde and volatile organic compounds to evaluate indoor air quality at two shops where some of the tenants reported health problems and the third floor hallway. Although these are important chemicals, they are not the only chemicals of concern for the inhalation pathway at the site. Semi-volatile organic compounds such as PAHs, which are associated with petroleum, should also be evaluated.

DOH compared the indoor air sampling results to environmental and health guidelines to assess and understand the potential health effects posed by exposures to site contaminants and to identify chemicals of concern. Environmental guidelines represent concentrations of a chemical in soil, water, or air to which humans may be exposed during a specified period of time without experiencing adverse health effects. Health guidelines represent doses of a chemical to which people may be exposed (usually expressed as micrograms of a chemical per cubic meter ( $\mu\text{g}/\text{m}^3$ )).

of air for air exposures) without adverse non-carcinogenic and carcinogenic effects. Environmental and health guidelines used during this health consultation are presented in Appendix A.

Table 1 presents detected indoor air chemical concentrations and environmental and health guidelines used by DOH during its evaluation of the indoor air samples. Chemicals that were detected below the environmental and health guideline values are not expected to cause adverse health effects and were not evaluated further. Benzene and formaldehyde exceeded the environmental and health guidelines. These two contaminants are considered contaminants of concern and were evaluated further to determine if they posed a health threat.

### *Benzene*

Benzene, a known carcinogen, is a common air contaminant. It is produced in the environment by natural processes, such forest fires and volcanoes, as well as from human activities. Tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions are the major human sources of benzene in air.<sup>10</sup> Indoor benzene concentrations are estimated to range from 10 to 15 ug/m<sup>3</sup>.<sup>11, 12</sup> People living in cities are generally exposed to higher concentrations of benzene than people living in rural areas. Indoor concentrations of benzene are generally higher than outdoor concentrations.

The benzene concentrations detected at the two Old Mill Town Mall shops and hallway (3 to <4.4 ug/m<sup>3</sup>) are below levels typically found in indoor air. A slight increase in cancer risk, typical for a person living in an urban environment, is associated with this level of benzene exposure.<sup>13</sup> Such cancer risk estimates are theoretical, however, and could be as low as zero. Non-cancer health effects such as respiratory problems are not anticipated to occur as a result of exposure to the benzene levels detected at the mall in March 2001.<sup>10</sup>

#### **Cancer Risk**

Cancer risk estimates do not reach zero no matter how low the level of exposure to a carcinogen. Terms used to describe this risk are defined below as the number of excess cancers expected in a lifetime:

<u>Term</u>		<u># of Excess Cancers</u>
low	is approximately equal to	1 in 10,000
very low	is approximately equal to	1 in 100,000
slight	is approximately equal to	1 in 1,000,000
insignificant	is less than	1 in 1,000,000

### *Formaldehyde*

Formaldehyde, a probable human carcinogen, is also produced in the environment by natural processes and human activities. Smog is a major source of formaldehyde that we breathe every day. Automobile exhaust from cars without catalytic converters or those using oxygenated gasoline also contain formaldehyde. At home, formaldehyde is produced by cigarettes and other tobacco products, and open fireplaces. Formaldehyde is found in small amounts in many common household products such as antiseptics, medicines, cosmetics, dish-washing liquids, fabric softeners, shoe-care agents, carpet cleaners, glues and adhesives, lacquers, paper, plastics, and some types of manufactured wood products. It is also used as a preservative in some foods,

such as some types of Italian cheeses, dried foods, and fish. However, formaldehyde used as a food preservative does not appear to be a source of indoor air contamination.<sup>14</sup>

Background concentrations of formaldehyde in outdoor air range from 1.2 to 83.5 ug/m<sup>3</sup>.<sup>14</sup> Indoor air concentrations are generally higher than outdoor concentrations. The estimated median daily indoor air concentration for formaldehyde is 124 ug/m<sup>3</sup>.<sup>11</sup> The formaldehyde concentration detected at the Old Mill Town Mall (7.9 to 12.3 ug/m<sup>3</sup>) falls within a range typically found in outdoor air and is well below the concentration estimated for indoor air. Although within the range of typical outdoor levels, the formaldehyde concentrations do pose an increased cancer risk.<sup>15</sup> Like benzene, however, the added cancer risk is typical for a person living in an urban environment. Non-cancer health effects such as respiratory problems are not anticipated to occur as a result of exposure to the levels of formaldehyde detected at the mall in March 2001.<sup>15</sup>

A number of chemicals were reported as non-detected. A commonly used method for evaluating chemicals reported as non-detected is to assume they are present at half of their detection limit. Using this approach, some chemicals reported as non-detected still exceed their respective environmental and health guideline values. Table 2 provides half detection limit values for those chemicals reported as non-detected along with the environmental and health guideline comparison values. Those chemicals where the half detection limit value exceeded the comparison value were further evaluated by comparing the results to background concentrations. The results of this comparison are presented in Table 3. It is unknown whether those chemicals that exceeded the guidelines and background concentrations are present at levels of health concern.

## **Conclusion**

Access to contaminated soil is limited and *poses no apparent public health hazard*. Worker exposure to contaminants in soil under the building or pavement is anticipated to be infrequent. Where worker exposure occurs, it is anticipated to be of only short-duration.

The indoor air samples taken at the mall do not provide enough data with which to evaluate the potential exposure to contaminants moving from soil into indoor air. As a result, the public health hazard cannot be determined (i.e., indeterminate public health risk). The only indoor air samples taken were analyzed with methods that are not sensitive enough to detect contaminants at very low levels. These indoor air samples do show that there is *no immediate health concern*. However, more samples, using additional analytical methods and lower detection limits, are needed to ensure that soil contaminants are not moving into indoor air at levels of health concern.

## **Recommendations**

1. The property owner should seal potential pathways for subsurface soil contaminants to migrate into indoor air. Such pathways could include floor drains, gaps between the floor and walls and cracked concrete floors.
2. The property owner should provide adequate ventilation in the retail shops and hallways to prevent buildup of chemicals in indoor air and reduce human exposure to potential contaminants.
3. Two additional rounds of indoor air samples should be collected and analyzed for volatile and semi-volatile organic compounds. The analytical methods used for this sampling should have reporting limits that are below health based screening values, if possible. One sampling round should be conducted during one of the summer months and the other sampling round should be conducted during one of the winter months to assess whether there are seasonal differences in indoor air chemical concentrations. The property owner should prepare a sampling and analysis plan (SAP) subject to review by DOH and other appropriate agencies prior to sampling.

## ***Action***

DOH is available to review future sampling plans to ensure that results will be adequate for future health evaluations.

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## **Designated Reviewers**

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## Certification

This Health Consultation was prepared by the Washington State Department of Health under cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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## Appendix A

## Contaminants of Concern

The criteria for listing a chemical as a contaminant of concern include exceedance or lack of media specific health comparison value, community health concerns, and data quality.

Media specific environmental guidelines represent concentrations of a chemical in soil, water or air to which people may be exposed (usually expressed as micrograms of a chemical per cubic meter (ug/m<sup>3</sup>) of air for air exposures) without adverse non-carcinogenic and carcinogenic effects. Environmental guidelines used during this health consultation include ATSDR-derived environmental media evaluation guidelines (EMEGs) and cancer risk evaluation guidelines (CREGs), EPA Region III Risk Based Concentrations (EPA III RBCs), State of Washington Class A Acceptable Source Impact Levels (ASILs) and Class B Toxic Air Pollutants and ASILs - 24 Hour Average, and State of Massachusetts 24-Hour Threshold Affects Level (TALs) and Acceptable Annual Ambient Air Concentrations. National Institute of Occupational Safety and Health (NIOSH) permissible exposure limits (PELs) were used when no other guideline was available since they were only developed to protect healthy workers exposed to work place chemical eight hours per day, five days per week.

EMEGs are media specific health comparison values derived from ATSDR minimal risk levels (MRLs). MRLs are estimates of daily exposure of a human to a chemical that is likely to be without an appreciable non-cancer risk over a specified duration of time. CREGs are estimated media specific contaminant concentrations that are anticipated to result in one excess cancer risk in one million persons exposed over a life time. CREGs are derived from EPA's cancer slope factors (CSFs), also known as cancer potency factors. CSFs are cancer potency estimates derived for chemicals shown to be carcinogenic in animals or humans. EPA Region III RBCs are derived using toxicity factors (i.e., reference doses (RfDs) and cancer slope factors (CSFs) combined with standard exposure scenarios to calculate chemical concentrations corresponding to fixed levels of risk (i.e., a hazard quotient of 1 or lifetime cancer risk of 1E-6, whichever occurs at a lower concentration) in water, air, fish tissue, and soil. State of Washington Class A acceptable source impact level is an annual average concentration, in micrograms per cubic meter, that may cause an increased cancer risk of one in one million. State of Washington Class B Toxic Air Pollutants and ASILs are derived using the inhalation reference concentration and specified averaging time dividing the TLV-TWA by three hundred to calculate a twenty-four hour TWA acceptable source impact level. State of Massachusetts 24-Hour TALs and Acceptable Annual Ambient Air Concentrations are 24-hour average and annual averages, respectively.